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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/663,949	09/16/2003	Roswell J. Ruka	2003P07614US	3856

7590 04/13/2005
Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, NJ 08830

EXAMINER

AUSTIN, MELISSA J

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 04/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/663,949	RUKA ET AL.	
	Examiner	Art Unit	
	Melissa Austin	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 19-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.
2. The declaration of prior ownership filed on 18 February 2005 under 37 CFR 1.131 is sufficient to overcome the Schmidt et al. (US 2004/0058225) reference.

Response to Amendment

3. Applicant's amendments, see drawings, filed 18 February 2005, with respect to objections to the drawings have been fully considered and are persuasive. The objection to the drawings of 15 November 2004 has been withdrawn.
4. Applicant's amendments, see Amendments to the Specification, filed 18 February 2005, with respect to objections to the specification have been fully considered and are persuasive. The objection to the specification of 15 November 2004 has been withdrawn.
5. Applicant's arguments, see remarks and Amendments to the Claims, filed 18 February 2005, with respect to rejections under 35 U.S.C. 112 have been fully considered and are persuasive. The rejection of claims 7, 13, 5-8, 11, and 14 under 35 U.S.C. 112 of 15 November 2004 has been withdrawn.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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2. Claims 1-4 and 12-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Schmidt et al. (US 2004/0058225). Schmidt et al. disclose a fuel cell, comprising: an air electrode; an electrolyte formed on at least a portion of the air electrode; and a plasma sprayed ceramic-metal fuel electrode formed on at least a portion of the electrolyte. The air electrode composition comprises lanthanum manganate. The electrolyte composition comprises yttria-stabilized zirconia. The ceramic-metal fuel electrode composition comprises nickel and zirconia. Yttria stabilized zirconia powder is used to obtain at least a portion of the zirconia. The yttria stabilized zirconia powder comprises at least 8 mole percent of yttria. The electrolyte composition comprises a solid oxide comprising a rare-earth element stabilized zirconia. The fuel cell comprises an interconnect that interconnects a plurality of fuel cells, wherein the interconnected fuel cells form a power generation system. (Pg. 1, [0004]; Pg. 3, [0031], [0033], [0034]; Pg. 5, [0035]; Pg. 6, [0051], [0056].

3. Claims 5-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Schmidt et al. (US 2004/0058225), as evidenced by Jensen (5,035,962). Schmidt teaches the elements of claim 4, as discussed in the 35 U.S.C. 35 U.S.C. 102(e) rejection above. Schmidt also teaches that "suitable formulations [for the fuel electrode material] may be used, such as those described in U.S. Pat. Nos. ... 5,035,962." In U.S. Patent No. 5,035,962, Jensen teaches a fuel electrode for an SOFC having a graded composition structure formed by successively depositing layers of nickel-yttria stabilized zirconia mixtures with different compositions (Col. 3, ll. 6-9). Tables 1 (Col. 9) gives the compositions of the layers on a volume basis. In order to convert the volume percentages to weight percentages, the following formula was used:

$$\text{Weight}\%_j = \frac{\text{Vol}\%_j (\text{Vol}_j + \text{Vol}_k) \rho_j}{[\text{Vol}\%_j (\text{Vol}_j + \text{Vol}_k) \rho_j] + \text{Vol}\%_k (\text{Vol}_j + \text{Vol}_k) \rho_k} = \frac{\text{Vol}\%_j \rho_j}{[\text{Vol}\%_j \rho_j + \text{Vol}\%_k \rho_k]}$$

The densities used were obtained from www.matweb.com for yttria stabilized zirconia and nickel. The following table lists the weight percents corresponding the volume percents of Jensen's Table 1.

	Volume percent ZrO ₂	Weight percent ZrO ₂	Volume percent Ni	Weight percent Ni
Layer 1	70-90	63-87	10-30	13-37
Layer 2	40-60	33-53	40-60	47-67
Layer 3	10-30	7.6-24	70-90	76-92.3

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As can be seen from the table Jensen teaches minimums of about 60% Ni and about 15% YSZ (claim 5) and about 70% Ni and about 20% YSZ (claim 6). Jensen also teaches maximums of about 85% Ni and about 50% YSZ (claim 7) and about 80% Ni and about 30% YSZ. The compositions of the individual layers of the multiple layer graded structure approximate a layer in which the composition is continuously graded from being high in zirconia at the electrolyte interface to being high in nickel at the external surface of the anode and meets the simultaneous requirements of adhesion of the yttria stabilized zirconia electrolyte and adequate electrode electrical conductivity.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schmidt et al. (US 2004/0058225) in view of Clemmer et al. (*Processing and Properties of Porous Ni-YSZ Metal/Ceramic Composites*), as evidenced by INCO, Ltd. Schmidt teaches the elements of claim 4 as discussed in the above 35 USC 102 rejection, incorporated herein, but fails to teach that at least a portion of nickel in the fuel electrode is obtained from nickel graphite powder.

Clemmer teaches Ni/yttria-stabilized zirconia fuel cell anodes in which Ni-coated graphite particles (55% Ni content; obtained from INCO, Ltd.: Pg. 233) were used as a starting material. Generally, the anodes created from the Ni-coated graphite particles had a lower coefficient of thermal expansion and higher electrical conductivity for a given Ni loading compared to the anodes made of separate Ni and graphite particles. The hybrid structures had intermediate values of coefficient of thermal expansion and electrical conductivity. (Abstract)

Nickel coated graphite particles available from INCO contain either 60 or 75% (www.incosp.com).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used Ni-coated graphite particles, such as those available from INCO, as a starting material for Ni/yttria-stabilized zirconia fuel cell anodes as taught by Clemmer in the fuel cell as taught by Schmidt in order to achieve lower coefficient of thermal expansion and higher electrical conductivity for a given Ni loading.

6. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schmidt et al. (US 2004/0058225) in view of Cable et al. (5,589,285). Schmidt teaches the elements of claim 1 as discussed in the previous 35 USC 102 rejection, incorporated herein. Schmidt also teaches an interlayer (applicant's precursor layer) formed by thermally spraying an interlayer with a thickness of 5-20 μ m on the electrolyte before depositing the electrode on the electrolyte (Pg. 1-2, [0015], Pg. 4, [0041]). However, the reference fails to teach that the interlayer contains zirconia.

Cable teaches an SOFC with a cathode containing lanthanum manganate (Col. 7, l 66 – Col. 8, l 2), an electrolyte of yttria-stabilized zirconia (Col. 8, ll. 12-14), and an anode containing a nickel powder mixed with zirconia (Col. 10, ll. 18-20). Between the electrolyte and anode, an interfacial layer (applicant's precursor layer) containing sulfur tolerant material is disposed (Col. 3, ll. 1-3); the interfacial layer may contain Y-doped ZrO₂ (Col. 10, ll. 1-4; applicant's zirconia). The thickness of the interfacial layer is generally 1-100 μ m, preferably less than 50 μ m (Col. 8, ll. 35-37). The interlayer serves to improve electrical contact between the electrolyte and anode and provides an environment in which the species can interact or react because the interlayer keeps sulfur from the fuel from poisoning the anode, particularly Ni/YSZ cermet anodes (Col. 8, ll. 19-34; Col. 6, ll. 55-63; Col. 18, ll. 23-29).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the interlayer between the anode and the electrolyte of the fuel cell as taught by Schmidt with Y-doped zirconia as taught by Cable in order to improve electrical contact and provide an environment in which the species can interact or react.

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7. The rejections under 35 U.S.C. 103(a) made above may be overcome by disqualifying the Schmidt et al. reference (US 2004/0058225) under 35 U.S.C. 103(c). This may be accomplished by providing evidence of common ownership or assignment at the time the current invention was made. See MPEP § 706.02(I).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melissa Austin whose telephone number is (571) 272-1247. The examiner can normally be reached on Monday - Thursday, alt. Friday, 7:15 AM - 4:15 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

mja

Melissa Austin
Patent Examiner
Art Unit 1745


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